Chapter 3.2 INDIVIDUAL RIVER BASIN DESCRIPTION and ASSESSMENTS

Potomac and Shenandoah River Basin

The Potomac-Shenandoah River Basin, as its name implies, is made up of the Shenandoah River Subbasin and the Potomac River Subbasin. It occupies the northern portion of Virginia and covers 5,747 square miles or 14 percent of the Commonwealth's total area.

In Virginia, the Potomac-Shenandoah basin is defined by both hydrologic and political boundaries. The James River, Rappahannock River, and York River Basins bound the basin to the west and south. The West Virginia and Maryland State lines and the District of Columbia bound the northern and eastern perimeter of the basin.

The Shenandoah River Subbasin headwaters begin in Augusta County and flow in a northeasterly direction for approximately 100 miles to the West Virginia State line. The basin averages 30 miles in width and covers 2, 926 square miles.

The topography of the Shenandoah River Subbasin is characterized by rolling hills and valleys bordered by the Appalachian Mountains to the west and the Blue Ridge Mountains to the east. The Massanutten Mountain Range divides the Shenandoah River into the North and South Forks. Tributaries of the Shenandoah River exhibit steep profiles as they drain the surrounding mountain ridge. The main stems of the Shenandoah exhibit a moderately sloping profile with occasional riffles and pools. 45 percent of the land is forested due to the large amount of federally owned land and the steep topography. Farmland and pasture account for 39 percent of the land area, while 16 percent is urban.

The Potomac River Subbasin headwaters begin in Highland County. The drainage area is 323 square miles for the headwaters. The river then flows in a northeasterly direction through West Virginia and Maryland before joining the Shenandoah at Harper's Ferry, West Virginia. The Potomac continues as the border between Maryland and Virginia. These waters flow in a southeasterly direction through Loudoun and Fauquier Counties to eventually less than one mile in Westmoreland County. Approximately 2, 821 of the 14,700 square miles of the Potomac River Subbasin drainage area lie in Virginia. The rest covers four states and the District of Columbia.

Gently sloping hills and valleys from Harpers Ferry to approximately 45 miles down river characterize the topography of the upper Piedmont region of the Potomac River Subbasin. In the central Piedmont area, the profile is rather flat until it nears the fall line at Great Falls, where the stream elevation rapidly descends from over 200 feet to sea level. Tributaries in the central Piedmont exhibit moderate and near constant profiles. Their flat slope largely characterizes streams in the Coastal Plain area. Approximately 40 percent of the Potomac River Basin is forested, 33 percent is farmland and pasture and an estimated 27 percent is urban.

The 2000 population for the Potomac-Shenandoah River Basin was approximately 2,347,763. The majority of the population resides in urban Virginia surrounding Washington, D.C. All or part of the following jurisdictions lie within the basin: counties – Augusta, Clarke, Frederick, Page, Rockingham, Shenandoah, Stafford, Warren, Highland, Arlington, Fairfax, Loudoun, Prince William, King George, Northumberland, and Westmoreland; cities – Alexandria, Fairfax, Falls Church, Harrisonburg, Staunton, Waynesboro, and Winchester.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the Potomac-Shenandoah River Basin

The Potomac-Shenandoah River Basin has a number of active citizen and other non-DEQ water quality monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by the Department of Environmental Quality (DEQ) for water quality assessment purposes.

The Alliance for the Chesapeake Bay (ACB) coordinates with several affiliate organizations in the Potomac River Subbasin to monitor a conventional suite of ambient parameters including dissolved

oxygen, temperature, pH, salinity and water clarity. ACB also coordinates monitoring at selected sites for a suite of parameters (including nutrients, water clarity, total suspended solids and chlorophyll *a*) related to submerged aquatic vegetation (SAV). Affiliate organizations in this subbasin include Caledon Natural Area, George Washington's Birthplace Monument, Leesylvania State Park, Mason Neck State Park, Tidewater Resource Conservation and Development Council, and Westmoreland State Park. Trained volunteers monitored 23 stations and conducted 788 sampling events in the Potomac River Subbasin during the five-year data window for this report. Some of this data met DEQ criteria to use directly for assessing water quality for dissolved oxygen, and temperature. Other data not meeting the criteria were used in this assessment to indicate areas needing potential follow-up monitoring.

The Audubon Naturalist Society (ANS) monitors benthic macroinvertebrates in the Potomac River Subbasin using the ANS protocol. Trained ANS volunteers monitored 22 stations in the Potomac Subbasin with 237 sampling events for benthic macroinvertebrates during the data window for this report. These data were used in this assessment to indicate areas needing potential follow-up monitoring.

The Environmental Alliance for Senior Involvement (EASI) monitors water quality in several locations around Virginia and in other states. One EASI chapter in Fauquier County submitted water quality data at one station for dissolved oxygen, temperature, pH, and nutrients. Upon review of the equipment and sampling protocols, temperature data met DEQ standards for assessment use.

The Friends of the Shenandoah River (FOSR) monitors ambient water quality for dissolved oxygen, pH, temperature, ammonia, nitrates, and orthophosphate in the Shenandoah River Subbasin. The FOSR submitted water quality data for the above mentioned parameters from June 1, 2004 to December 31, 2004. This coincided with DEQ approving the sampling and analysis methods employed by FOSR volunteers. The data for the six months cover 149 sites comprising of 1,115 sample events. Of these samples, 33 sample sites were not included in the assessment report due to missing site coordinates or sample locations were within VPDES permitted mixing zones. Data for dissolved oxygen, pH, temperature, and ammonia will be used directly in the assessment report.

The Loudoun Wildlife Conservancy (LWC) monitors benthic macroinvertebrates using the Audubon Naturalist Society protocol in Loudoun County located in the Potomac River Subbasin. Trained LWC volunteers monitored 31 stations during 158 sampling events for benthic macroinvertebrates. The data will be used to in this assessment to indicate areas that needs potential follow-up monitoring.

The National Park Service has conducted intensive water quality monitoring in the National Parks located in Virginia. Of the eight national parks in Virginia, the Shenandoah National Park submitted water quality monitoring data in time for DEQ for review and include in the 2006 assessment report. The Shenandoah National Park submitted data for dissolved oxygen, pH, temperature, and benthic macro-invertebrate monitoring. Upon review of the data, the benthic macroinvertebrate data was used to indicate potential follow-up monitoring locations.

The North Fork Goose Creek Watershed Committee monitors a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, and nutrients in the Potomac River Subbasin. Additional data from July 1, 2002 to December 31, 2004 was not submitted to DEQ. Historical data from the previous assessment report is still present in the 2006 report. At this time, data from the previous data submissions cover 9 sample stations for 225 sampling events. As in previous assessment reports, the data for these sites was used in this assessment to indicate areas needing potential follow-up monitoring.

The Shenandoah River Monitoring Project is a study performed by the University of Virginia to identify and track pH in water along the Shenandoah River Subbasin. The data supplied though this study from October 2003 to September 2004 meet DEQ criteria to be used in assessing the pH at 20 sample sites. Many of these sites are in remote locations within the Shenandoah National Forest.

The United States Forest Service (USFS) conducts an intensive ambient and benthic macroinvertebrate study in and around the national forests in Virginia. The USFS has monitored at 49 stations covering 201 sample events from January 2000 to December 2004. Upon review of sampling protocols, DEQ will use the benthic macroinvertebrate data to assess water quality.

The United States Geological Survey (USGS) submitted water quality data for 40 sampling stations covering 4,920 sample events from January 1, 2000 to December 31, 2004. The stations

monitored many ambient water quality parameters from dissolved oxygen and pH to dissolved metals. The USGS follows EPA protocols for sampling and analysis of results. USGS monitoring data was used by DEQ to assess conditions at these sample sites.

The Virginia Save Our Streams Program of the Virginia Division of the Izaak Walton League of America (VA SOS) coordinates with a number of affiliate organizations in the Potomac-Shenandoah River Basin to monitor benthic macroinvertebrates. Affiliate organizations in this basin include Friends of the North Fork of the Shenandoah River, Friends of the North River, Friends of Page Valley, Middle River Monitors, Northern Virginia Soil and Water Conservation District, North Fork Goose Creek Watershed Committee, Reston Association, and the Warren County Chapter of the IWLA. Certified VA SOS volunteers sampled 132 stations (104 in the Potomac River Subbasin and 28 in the Shenandoah River Subbasin) during 601 sampling events for benthic macroinvertebrates. These data were used in this assessment to indicate areas needing potential follow-up monitoring.

The Potomac-Shenandoah River Basin is divided into eight USGS hydrologic units as follows: HUC 02070001- South Branch Potomac; HUC 02070004-Conococheague-Opequon; HUC 02070005- South Fork Shenandoah; HUC 02070006- North Fork Shenandoah; HUC 02070007- Shenandoah; HUC 02070008- Middle Potomac-Catoctin; HUC 02070010- Middle Potomac-Anacostia-Occoquan; HUC 02070011- Lower Potomac. The eight hydrologic units are further divided into 87 waterbodies or watersheds.

Basin assessment information is included in Tables 3.2-1-1, 3.2-1-2, 3.2-1-3.

Table 3.2-1-1 **POTOMAC-SHENANDOAH RIVER BASIN INDIVIDUAL USE SUPPORT SUMMARY TABLE**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 5,890 miles
Lakes - 3,171 acres
Estuaries - 59 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	1,582	800	118	202	3,286	2,382
	Lakes (acres)	394	1,710	1,453	0	1,067	2,104
	Estuary (sq. mi.)	0	59	0	0	0	59
Fishing	River (mi)	229	217	0	0	5,423	446
	Lakes (acres)	98	38	0	0	3,034	136
	Estuary (sq. mi.)	0	30	0	0	29	30
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	24	9	0	0	1	33
Swimming	River (mi)	578	1,291	2	89	3,911	1,869
	Lakes (acres)	673	0	0	0	2,498	673
	Estuary (sq. mi.)	13	7	0	0	39	20
Public Water Supply	River (mi)	250	2	0	1	1,746	252
	Lakes (acres)	242	0	0	0	2,469	242
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	2,070	0	0	5	3,793	2,070
	Lakes (acres)	673	0	0	0	2,498	673
	Estuary (sq. mi.)	28	1	1	0	30	29

Chesapeake Bay Designated Uses

Open Water Aquatic Life Use	Estuary (sq. mi.)	0	43	0	16	0	43
Deep Water Aquatic Life Use	Estuary (sq. mi.)	0	3	0	0	0	3
Deep Channel Aquatic Life Use	Estuary (sq. mi.)	0	0	0	0	1	0
Submerged Vegetation	Estuary (sq. mi.)	6	7	0	0	0	13
Migratory Spawning	Estuary (sq. mi.)	0	0	0	0	30	0

TABLE 3.2-1-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN POTOMAC-SHENANDOAH BASIN

Pollutant	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Aquatic Plants (Macrophytes)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 7
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	479 0 1
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	254 223 3
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	69 1,710 43
Temperature	River (mi) Lakes (acres) Estuary (sq. mi.)	80 97 0
Fecal Coliform Pathogen Indicator	River (mi) Lakes (acres) Estuary (sq. mi.)	911 0 12
Escherichia coli Pathogen Indicator	River (mi) Lakes (acres) Estuary (sq. mi.)	591 0 2
Enterococcus Pathogen Indicator	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 2
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	96 38 30
Heptachlor Epoxide	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 0
Benzo(k)fluoranthene	River (mi) Lakes (acres) Estuary (sq. mi.)	8 0 0
Nitrate	River (mi) Lakes (acres) Estuary (sq. mi.)	2 0 0
Mercury in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	128 0 0
Chlordane	River (mi) Lakes (acres) Estuary (sq. mi.)	2 0 0
Chloride	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1

TABLE 3.2-1-3 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN POTOMAC-SHENANDOAH BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Agriculture	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 59
Industrial Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 59
Municipal Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 59
Atmospheric Deposition – Acidity	River (mi) Lakes (acres) Estuary (sq. mi.)	190 169 0
Atmospheric Deposition – Nitrogen	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 59
Changes in Ordinary Stratification and Bottom Waters Hypoxia/Anoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 33 3
Channelization	River (mi) Lakes (acres) Estuary (sq. mi.)	3 0 0
Urbanized High Density Area	River (mi) Lakes (acres) Estuary (sq. mi.)	87 0 0
Commercial Districts (Industrial Parks)	River (mi) Lakes (acres) Estuary (sq. mi.)	3 0 0
Clean Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 51
Contaminated Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	167 0 0
Dry Crop Land	River (mi) Lakes (acres) Estuary (sq. mi.)	17 0 0
Grazing in Riparian or Shoreline Zones	River (mi) Lakes (acres) Estuary (sq. mi.)	117 0 0
Impervious Surfaces	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 0
Internal Nutrient Recycling	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 59
Livestock (Grazing or Feeding Operations)	River (mi) Lakes (acres) Estuary (sq. mi.)	93 0 0
Loss of Riparian Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 59
Manure Runoff	River (mi) Lakes (acres) Estuary (sq. mi.)	35 0 0
Erosion and Sedimentation	River (mi) Lakes (acres) Estuary (sq. mi.)	21 0 0

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Sediment Resuspension	River (mi) Lakes (acres) Estuary (sq. mi.	0 0 7
Non-Point Source	River (mi) Lakes (acres) Estuary (sq. mi.)	729 0 2
Wastes from Pets	River (mi) Lakes (acres) Estuary (sq. mi.)	28 0 0
Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	87 0 0
Wildlife other than Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	844 0 0
Wet Weather Discharge	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 59
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	607 189 37
Source Outside of Jurisdiction	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 59
Inappropriate Waste Disposal	River (mi) Lakes (acres) Estuary (sq. mi.)	10 0 0
Sewage Discharge in Unsewered Areas	River (mi) Lakes (acres) Estuary (sq. mi.)	87 0 0
Natural Conditions-Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	126 1,622 1
Illicit Connections/Hookups to Storm Sewers	River (mi) Lakes (acres) Estuary (sq. mi.)	13 0 0

James River Basin

The James River Basin occupies the central portion of Virginia and covers 10,206 square miles or approximately 25 percent of the Commonwealth's total land area. It is Virginia's largest river basin and is made up of the Upper, Middle, and Lower James River Subbasin and the Appomattox River Subbasin.

The James River Basin is defined by both hydrologic and political boundaries. The Potomac-Shenandoah River Basin, the Rappahannock River Basin and the York River Basins bound the basin to the north. The southern boundary is made up of the New River Basin, the Roanoke River Basin and the Chowan River Basin. Its headwaters originate along the Virginia/West Virginia state line.

The James River Basin begins in the Alleghany Mountains and flows in a southeasterly direction to Hampton Roads where it enters the Chesapeake Bay. The James is formed by the confluence of the Jackson and Cowpasture Rivers and flows 228 miles to the Fall Line at Richmond and another 111 miles to the Chesapeake Bay.

The topography of the James River Basin varies throughout the four physiographic provinces that it spans. The Valley and Ridge Province extends from the Appalachian Plateau in West Virginia to the Blue Ridge Province. This province is dominated by narrow ridges and valleys running in a northeast/southwest direction, turning into a broad valley with low, rounded hills in the extreme southeast section of the province. The Blue Ridge Province, a remnant of a former highland, differs from the Valley and Ridge Province to the Fall Line. The western section of the Piedmont has scattered hills and small mountains, gradually turning into gently rolling slopes and lower elevation in the eastern Piedmont Province. The Fall Zone separates the Coastal Plain Province from the Piedmont. The Fall Zone is a three-mile stretch of river running through Richmond where the river descends 84 feet as it flows from the resistant rocks of the Piedmont to the softer sediments of the Coastal Plain.

Over 65 percent of the James River Basin is forested, with 19 percent in cropland and pasture. Approximately 12 percent is considered urban. The 2000 population for the James River Basin was approximately 2,180,856. This population is concentrated in two metropolitan areas: Tidewater, with over one million people, and the Greater Richmond – Petersburg area with over 750,000. Two smaller population centers are the Lynchburg and Charlottesville areas, each with over 100,000 people. All or portions of the following 38 counties and 14 cities lie within the basin: counties - Alleghany, Amherst, Bath, Nelson, Rockbridge, Augusta, Bedford, Botetourt, Campbell, Craig, Giles, Highland, Montgomery, Roanoke, Amelia, Buckingham, Chesterfield, Cumberland, Fluvanna, Goochland, Henrico, Powhatan, Albemarle, Appomattox, Prince Edward, Dinwiddie, Greene, Hanover, Louisa, Nottoway, Orange, Charles City, Isle of Wight, James City, New Kent, Prince George, Surry, and York; cities - Buena Vista, Clifton Forge, Covington, Lexington, Lynchburg, Charlottesville, Colonial Heights, Petersburg, Richmond, Hopewell, Norfolk, Newport News, Suffolk, and Williamsburg.

Average annual precipitation is 42.5 inches. Average annual snowfall amount ranges from over 30 inches in the mountains to less than 10 inches along the coast.

Major tributaries to the James River are Jackson River, Cowpasture River, Craig Creek, Maury River, Tye River, Rockfish River, Slate River, Rivanna River, Willis Creek, Appomattox River, Chichahominy River, Pagan River, Nansemond River, and the Elizabeth River.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the James River Basin

The James River Basin has a number of active citizen and non-agency monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by DEQ for water quality assessment purposes.

The Alliance for the Chesapeake Bay (ACB) coordinates with a number of affiliate organizations in the James River Basin to monitor a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, salinity and water clarity. ACB also coordinates monitoring at selected sites for

a suite of parameters (including nutrients, water clarity, total suspended solids and chlorophyll *a*) related to submerged aquatic vegetation (SAV). Affiliate organizations in this basin include Cherokee Lake Association, Chesapeake Bay Youth Conservation Corps, Chippokes State Park, Elizabeth River Project, Friends of Chesterfield's Riverfront, Friends of Scott's Creek, James River Association, and James River Park. Trained volunteers monitored 56 stations and conducted 2,376 sampling events in the James River Basin during the five-year data window for this report. Some of this data met DEQ criteria to use directly for assessing water quality for dissolved oxygen and temperature. Other data not meeting the criteria were used in this assessment to indicate areas needing potential follow-up monitoring.

The Appomattox River Water Quality Monitoring Program (coordinated by Clean Virginia Waterways and Longwood University) monitors a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, nutrients, water clarity, and E. coli bacteria in the Appomattox River Subbasin of the James River Basin. Trained volunteers monitored 20 stations during 351 sampling events in this basin. The data for these sites were used in this assessment to indicate areas needing follow-up monitoring. Upon review of sampling and laboratory procedures to sample for E. coli, DEQ will use E. coli data sampled after November 2004 for assessment purposes.

The City of Norfolk Lakes and Reservoirs Program monitors several waterbodies in the James River basin as part of a routine program to test source water quality for drinking water. The program monitored 18 stations with a total of 290 sample events. The parameters monitored were dissolved oxygen, pH, temperature, and salinity. These stations were monitored from February 2003 to November 2004. Upon review of the equipment, calibration logs, and quality assurance project plan, DEQ is accepting data for dissolved oxygen, pH, and temperature for data where calibration of the equipment was determined to be acceptable.

Chesterfield County Office of Water Programs submitted water quality data for 26 stations within Chesterfield County. These stations were monitored from January 2002 to December 2003 and monitored temperature, dissolved oxygen, pH, nutrients and similar parameters. Upon review of the data, calibration logs, and equipment, the data collected for dissolved oxygen, pH, and temperature were used in this assessment to indicate areas that need potential follow-up monitoring.

Sweet Briar College monitors a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, nutrients, water clarity, and E. coli bacteria in several small tributaries that feed into the James River. Students monitored 6 stations on 6 sampling events in May and June of 2004. Upon review of sampling and laboratory procedures, DEQ will use E. coli data collected after May 2004 for assessment purposes.

The United States Forest Service (USFS) conducts an intensive ambient and benthic macroinvertebrate study in and around the many national forests in Virginia. The USFS has monitored 95 stations covering 359 sample events from January 2000 to December 2004. Upon review of sampling protocols, DEQ will use the benthic macroinvertebrate data in assessing water quality in these waters.

The United States Geological Survey (USGS) submitted water quality data for 42 sampling stations covering 425 sample events from January 1, 2000 to December 31, 2004. The stations monitored many ambient water quality parameters from dissolved oxygen and pH to dissolved metals. The USGS follows EPA protocols for sampling and analysis of results. USGS monitoring data identified as having a Virginia Water Quality Standard were used by DEQ to assess water quality at these sample sites.

The Virginia Save Our Streams Program of the Virginia Division of the Izaak Walton League of America (VA SOS) coordinates with a number of affiliate organizations in the James River Basin to monitor benthic macroinvertebrates. Affiliate organizations in this basin include Amelia County Landfill, Buckingham Citizen Action League, Cowpasture River Preservation Association, Douthat State Park, Environmentally Concerned Citizens Organization, Environmental Education Center, Friends of the Pedlar River, Friends of the Rockfish River, Maury River Middle School, Maury River Monitors, Mountain Stream Stewards, Pedlar River Institute, Piedmont Environmental Council, Rivanna Conservation Society, Rivanna River Basin Project, the Skyline Chapter of Trout Unlimited, and StreamWatch. Certified VA SOS volunteers sampled 93 stations in the James River Basin during 303 sampling events for benthic

macroinvertebrates. The data for these sites were used in this assessment to indicate areas needing potential follow-up monitoring.

The James River Basin is divided into seven USGS hydrologic units as follows: HUC 02080201 – Upper James, HUC 02080202 – the Maury, HUC 02080203 – Upper Middle James, HUC 02080204 – the Rivanna, HUC 02080205 – the Lower Middle James, HUC 02080206 – Lower James, and HUC 02080207 – the Appomattox, and HUC 02080208 – the Elizabeth. The nine hydrologic units are further divided into 92 waterbodies or watersheds.

Basin assessment information is presented in Tables 3.2-2-1, 3.2-2-2, 3.2-2-3.

TABLE 3.2-2-1 **JAMES RIVER BASIN INDIVIDUAL USE SUPPORT SUMMARY TABLE**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 12,973 miles
Lakes - 19,859 acres
Estuaries - 275 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	2,978	571	260	239	9,186	3,549
	Lakes (acres)	493	19,167	6,752	0	199	19,660
	Estuary (sq. mi.)	0	275	0	0	0	275
Fishing	River (mi)	1,272	209	0	96	11,396	1,481
	Lakes (acres)	9,727	0	0	0	10,132	9,727
	Estuary (sq. mi.)	15	259	0	0	0	274
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	95	17	0	0	0	112
Swimming	River (mi)	1,117	1,503	0	222	10,074	2,620
	Lakes (acres)	18,018	0	0	597	1,244	18,018
	Estuary (sq. mi.)	216	41	0	1	17	257
Public Water Supply	River (mi)	355	0	0	0	1,147	355
	Lakes (acres)	8,974	0	0	0	5,344	8,974
	Estuary (sq. mi.)	7	0	0	0	0	7
Wildlife	River (mi)	2,871	0	0	96	10,007	2,871
	Lakes (acres)	19,260	290	0	0	309	19,550
	Estuary (sq. mi.)	238	19	19	0	17	257

Chesapeake Bay Designated Use

Open Water Aquatic Life Use	Estuary (sq. mi.)	0	236	0	39	0	236
Deep Water Aquatic Life Use	Estuary (sq. mi.)	0	1	0	0	0	1
Deep Channel Aquatic Life Use	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Submerged Vegetation	Estuary (sq. mi.)	1	3	0	0	0	4
Migratory Spawning	Estuary (sq. mi.)	0	0	0	0	224	0

TABLE 3.2-2-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN JAMES BASIN

Pollutant	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	133 0 182
Aquatic Plants (Macrophytes)	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 3
Aldrin	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 0
Chloride	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 19
Copper	River (mi) Lakes (acres) Estuary (sq. mi.)	0 290 0
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	245 699 0
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	210 19,012 236
Temperature	River (mi) Lakes (acres) Estuary (sq. mi.)	100 0 0
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	914 0 37
Escherichia coli Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	748 0 21
Enterococcus Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 16
Sulfates	River (mi) Lakes (acres) Estuary (sq. mi.)	10 0 0
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	209 0 259
Tributyltin (TBT)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 11

TABLE 3.2-2-3 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN JAMES BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Industrial Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	84 0 275
Municipal Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	104 0 275
Urbanized High Density Area	River (mi) Lakes (acres) Estuary (sq. mi.)	43 290 0
Combined Sewer Overflow	River (mi) Lakes (acres) Estuary (sq. mi.)	35 0 9
Abandoned Mines	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 0
Agriculture	River (mi) Lakes (acres) Estuary (sq. mi.)	94 0 275
Atmospheric Deposition – Acidity	River (mi) Lakes (acres) Estuary (sq. mi.)	31 174 0
Atmospheric Deposition – Nitrogen	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 275
Clean Sediment	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 3
Contaminated Sediment	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 10
Shipbuilding/Drydock and Ship Repairs	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 11
Shipping Wastes	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 11
Changes in Ordinary Stratification and Bottom Water Anoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 4,157 0
Urban Runoff & Storm Sewers	River (mi) Lakes (acres) Estuary (sq. mi.)	31 0 0
Internal Nutrient Recycling	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 275
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	266 7,286 19
Non-Point Source	River (mi) Lakes (acres) Estuary (sq. mi.)	753 106 12
Septic Systems	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 0
Wildlife other than Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	624 0 0
Upstream Source	River (mi) Lakes (acres) Estuary (sq. mi.)	21 0 0

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Landfills	River (mi) Lakes (acres) Estuary (sq. mi.)	2 0 0
Loss of Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 275
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	819 8,292 262
Source Outside of Jurisdiction	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 275
Drought Related Impacts	River (mi) Lakes (acres) Estuary (sq. mi.)	18 0 0
Mine Tailings	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 0
Dam or Impoundment	River (mi) Lakes (acres) Estuary (sq. mi.)	12 454 0
Pet Waste	River (mi) Lakes (acres) Estuary (sq. mi.)	139 0 0
Domestic Waste	River (mi) Lakes (acres) Estuary (sq. mi.)	151 0 0
Livestock Grazing	River (mi) Lakes (acres) Estuary (sq. mi.)	187 0 0
Wet Weather (Point Source)	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 275
Wet Weather (Non Point Source)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 215

Rappahannock River Basin

The Rappahannock River Basin is located in the northeastern portion of Virginia and covers 2,715 square miles or approximately 6.8 percent of the Commonwealth's total area.

The Rappahannock River Basin is bordered by the Potomac-Shenandoah Basin to the north and the York River Basin and Coastal Basin to the south. The headwaters lie in Fauquier and Rappahannock Counties and flow in a southeasterly direction to its mouth, where it enters the Chesapeake Bay between Lancaster and Middlesex Counties. The Rappahannock River Basin is 184 miles in length and varies in width from 20 to 50 miles. The Rappahannock River Basin's major tributaries are the Hazel River, Thornton River, Mountain Run, Rapidan River, Robinson River, Cat Point Creek, and the Corotoman River.

The topography of the Rappahannock River Basin changes from steep to flat as it flows from the Blue Ridge Mountains to the Chesapeake Bay. About 51 percent of the basin land is forest, while pasture and cropland make up another 36 percent. Only about 6 percent of the land area is considered urban.

Most of the Rappahannock River Basin lies in the eastern Piedmont and Tidewater areas of the Commonwealth while its headwaters, located on the eastern slopes of the Blue Ridge, are considered to be in the northern and western Piedmont section.

The 2000 population of the Rappahannock River Basin was approximately 241,602. The basin is mostly rural in character with no large population centers. However, the influence of metropolitan Washington is beginning to be felt in the Fredericksburg and Fauquier areas of the basin. All or portions of the following 18 counties lie within the Basin: Albemarle, Caroline, Culpeper, Essex, Fauquier, Gloucester, Greene, King and Queen, King George, Lancaster, Madison, Middlesex, Orange, Rappahannock, Richmond, Spotsylvania, Stafford, and Westmoreland.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the Rappahannock River Basin

The Rappahannock River Basin has a number of active citizen and non-agency monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by DEQ for water quality assessment purposes.

The Alliance for the Chesapeake Bay (ACB) coordinates with several affiliate organizations in the Rappahannock River Basin to monitor a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, salinity and water clarity. Affiliate organizations in this basin include Cat Point Creek Group, Friends of the Rappahannock and the Tidewater Resource Conservation and Development Council. Trained volunteers conducted 699 sampling events at 14 stations in the Rappahannock River Basin during the 5-year data window for this report. Some of this data met DEQ QA/QC criteria for directly assessing water quality for dissolved oxygen, and temperature. Other data not meeting the QA/QC criteria were used in this assessment to indicate areas needing potential follow-up monitoring.

The Chesapeake Bay Governors School, in association with the Tidewater Resource Conservation and Development, monitored several ambient water quality parameters. These parameters included dissolved oxygen, pH, temperature, and turbidity. There were 78 sample events at 12 sample stations from December 2003 to November 2004. Upon review of calibration logs, quality assurance project plan, and other documents, DEQ will utilize dissolved oxygen, pH, and temperature readings for assessment purposes.

The United States Geological Survey (USGS) submitted water quality data for 14 sampling stations covering 134 sample events from January 1, 2000 to December 31, 2004. The stations monitored many ambient water quality parameters from dissolved oxygen and pH to dissolved metals. The USGS follows EPA protocols for sampling and analysis of results. USGS monitoring data that have a Virginia Water Quality Standard were used by DEQ to assess water quality at these sample sites.

The Upper Rappahannock Watershed Stream Monitoring Program monitors a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, fecal coliform bacteria, nutrients, and solids in this river basin. Trained volunteers conducted 136 sampling events at 31 stations in this basin. The data for these sites were used in this assessment to indicate areas needing potential follow-up monitoring.

The Virginia Save Our Streams Program of the Virginia Division of the Izaak Walton League of America (VA SOS) coordinates with several affiliate organizations in the Rappahannock River Basin to monitor benthic macroinvertebrates. Affiliate organizations in this basin include Friends of the Rappahannock and the Upper Rappahannock Watershed Stream Monitoring Program (coordinated by the Culpeper and John Marshall Soil and Water Conservation Districts). Certified VA SOS volunteers sampled 92 stations in the Rappahannock River Basin during 397 sampling events for benthic macroinvertebrates. The data for these sites were used in this assessment to indicate areas needing potential follow-up monitoring.

The Rappahannock River Basin is divided into two USGS hydrologic units as follows: HUC 02080103 – Rapidan – Upper Rappahannock; and HUC 02080104 – Lower Rappahannock.

Basin assessment information is presented in Tables 3.2-3-1, 3.2-3-2, 3.2-3-3.

TABLE 3.2-3-1 **RAPPAHANNOCK RIVER BASIN INDIVIDUAL USE SUPPORT SUMMARY TABLE**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 2,826 miles
Lakes - 488 acres
Estuaries - 156 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	470	204	188	185	1967	674
	Lakes (acres)	0	488	328	0	0	488
	Estuary (sq. mi.)	0	155	3	1	0	155
Fishing	River (mi)	45	29	0	0	0	74
	Lakes (acres)	0	0	0	0	488	0
	Estuary (sq. mi.)	7	129	0	0	21	136
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	110	15	0	0	11	125
Swimming	River (mi)	109	327	0	17	2,372	436
	Lakes (acres)	488	0	0	0	0	488
	Estuary (sq. mi.)	129	7	0	1	19	136
Public Water Supply	River (mi)	28	0	0	4	573	28
	Lakes (acres)	408	0	0	0	80	408
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	566	0	0	11	2,248	566
	Lakes (acres)	488	0	0	0	0	488
	Estuary (sq. mi.)	77	58	58	0	21	135

Chesapeake Bay Designated Uses

Open Water Aquatic Life Use	Estuary (sq. mi.)	0	136	0	21	0	136
Deep Water Aquatic Life Use	Estuary (sq. mi.)	0	44	0	0	0	44
Deep Channel Aquatic Life Use	Estuary (sq. mi.)	0	0	0	0	8	0
Submerged Vegetation	Estuary (sq. mi.)	4	5	0	0	0	9
Migratory Spawning	Estuary (sq. mi.)	0	0	0	0	58	0

TABLE 3.2-3-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN RAPPAHANNOCK BASIN

Pollutant	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Aquatic Plants (Macrophytes)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 5
Chloride	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 58
Estuarine Sediment Bioassay	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	199 413 1
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	63 328 136
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	169 0 16
E. coli Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	242 0 4
Enterococcus Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1
Temperature	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 0
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	29 0 129

TABLE 3.2-3-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN RAPPAHANNOCK BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Agriculture	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Atmospheric Deposition (Nitrogen)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Clean Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 5
Changes in Ordinary Stratification and Bottom Water Hypoxia/Anoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 129
Impervious Surfaces	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 0
Land Application of Waste	River (mi) Lakes (acres) Estuary (sq. mi.)	54 0 0
Industrial Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Internal Nutrient Recycling	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Municipal Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Manure Runoff	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 0
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	188 328 58
Livestock Grazing Operations	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 0
Loss of Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Non Point Source	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 3
Forest/Grassland Runoff	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 0
On-site Treatment Systems (Septic)	River (mi) Lakes (acres) Estuary (sq. mi.)	23 0 0
Sediment Resuspension	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 5

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Sewage Discharge in Unsewered Areas	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 5
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	249 160 136
Sources Outside of Jurisdiction	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Wet Weather Discharges (Point Source)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 152
Waste from Pets	River (mi) Lakes (acres) Estuary (sq. mi.)	73 0 0
Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 0
Wildlife other than Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 0

Roanoke River Basin

The Roanoke River Basin covers 6,382 square miles or approximately 16 percent of the Commonwealth's total area. In addition to the Roanoke itself, the basin also contains the Ararat River Subbasin.

The Virginia portion of the Roanoke River Basin is defined by both hydrologic and political boundaries. The basin is bound by the James River Basin, on the east, to the north by the Chowan River Basin, and to the west by the New River Basin. The southern boundary of the basin is the Virginia/North Carolina State line.

The topography of the Roanoke River Basin ranges from steep slopes and valleys in the Valley and Ridge Province to gently sloping terrain east of the mountains in the Piedmont Province.

The Roanoke River Basin headwaters begin in the mountainous terrain of eastern Montgomery County and flow in a southeasterly direction to the Virginia/North Carolina State line. The Roanoke Basin passes through three physiographic provinces, the Valley and Ridge Province to the northwest, and the Blue Ridge and Piedmont Provinces to the southeast.

The Roanoke watershed is large enough to accommodate two major reservoirs, Smith Mountain and Leesville Lakes to the north and Kerr Reservoir and Lake Gaston located at the junction of the Roanoke River and the North Carolina state line. These reservoirs range in size from the 49,000 acre Kerr Reservoir to the 3,400 acre Leesville Lake. These impoundments are used for both recreation and hydroelectricity. Major tributaries in the northern section of the basin are the Little Otter and Big Otter Rivers along with the Blackwater and Pigg Rivers. Major tributaries in the southern portion include the Dan River, Smith River, and Banister River. Over 62 percent of the Roanoke River Basin is forested, while nearly 25 percent is in cropland and pasture. Approximately 10 percent is considered urban.

The 2000 population for the Roanoke River Basin was approximately 675,844. All or portions of the following sixteen counties and five cities lie within the basin: counties – Patrick, Henry, Pittsylvania, Halifax, Franklin, Mecklenburg, Roanoke, Bedford, Campbell, Charlotte, Carroll, Brunswick, Montgomery, Botetourt, Floyd, and Appomattox; cities – Roanoke, Salem, Martinsville, Danville, and Bedford.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the Roanoke River Basin

The Roanoke River Basin has several active citizen monitoring organizations collecting and analyzing benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and DEQ approved QA/QC data for water quality assessment purposes.

The Virginia Save Our Streams Program of the Virginia Division of the Izaak Walton League of America (VA SOS) coordinates with several affiliate organizations in the Roanoke River Basin to monitor benthic macroinvertebrates. Affiliate organizations in this basin include Elliott Creek Watershed Protection Council, Virginia's Explore Park, and the Virginia Museum of Natural History at Virginia Tech. Certified VA SOS volunteers conducted 31 sampling events for benthic macroinvertebrates at 17 stations in the Roanoke River Basin during the assessment data window. The data for these sites were used in this assessment to indicate areas needing potential follow-up monitoring.

The Roanoke River Basin is divided into six USGS hydrologic units as follows: HUC 03010101 – Upper Roanoke; HUC 03010102 – Middle Roanoke; HUC 03010103 – Upper Dan; HUC 03010104 – Lower Dan; HUC 03010105 – Banister, and HUC 03010106 – Roanoke Rapids.

Basin assessment information is presented in Tables 3.2-4-1, 3.2-4-2, 3.2-4-3.

TABLE 3.2-4-1 **ROANOKE RIVER BASIN INDIVIDUAL USE SUPPORT SUMMARY**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 9,409 miles
Lakes - 66,203 acres
Estuaries - 0 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	1,785	190	34	43	7,391	1,975
	Lakes (acres)	2,213	62,000	51,406	0	1,990	64,213
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Fishing	River (mi)	219	212	0	0	8,978	431
	Lakes (acres)	4,973	56,253	0	0	4,977	61,226
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Swimming	River (mi)	249	1,386	0	135	7,639	1,635
	Lakes (acres)	58,789	4,472	0	479	2,464	63,271
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Public Water Supply	River (mi)	754	0	0	0	3,476	754
	Lakes (acres)	61,282	0	0	0	2,464	61,282
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	1,634	0	0	1	7,774	1,634
	Lakes (acres)	63,548	0	0	0	2,655	63,548
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA

TABLE 3.2-4-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN ROANOKE BASIN

Pollutant	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	86 0 -
DDE	River (mi) Lakes (acres) Estuary (sq. mi.)	10 0 -
DDT	River (mi) Lakes (acres) Estuary (sq. mi.)	10 0 -
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	212 56,253 -
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	14 3,155 -
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	18 62,000 -
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	779 1,063 -
Escherichia coli Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	910 4,472 -
Temperature	River (mi) Lakes (acres) Estuary (sq. mi.)	83 0 -

TABLE 3.2-4-3 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN ROANOKE BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Clean Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	15 0 -
Changes in Ordinary Stratification and Bottom Waters Hypoxia/Anoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 3,387 -
Dam or Impoundment	River (mi) Lakes (acres) Estuary (sq. mi.)	20 1,380 -
Urban Storm Sewer Systems	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 -
Livestock Grazing	River (mi) Lakes (acres) Estuary (sq. mi.)	642 2,466 -
Loss of Riparian Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	28 0 -
Crop Production	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 -
Urbanized High Density Area	River (mi) Lakes (acres) Estuary (sq. mi.)	288 350 -
Municipal Point Source Discharges	River (mi) Lakes (acres) Estuary (sq. mi.)	24 0 -
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	34 54,560 -
Package Plant or Other Permitted Small Flow Discharges	River (mi) Lakes (acres) Estuary (sq. mi.)	3 0 -
Non-Point Source	River (mi) Lakes (acres) Estuary (sq. mi.)	27 0 -
Sanitary Sewer Overflows	River (mi) Lakes (acres) Estuary (sq. mi.)	80 350 -
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	815 57,761 -
Streambank Modification or Destabilization	River (mi) Lakes (acres) Estuary (sq. mi.)	21 0 -
On Site Treatment Systems	River (mi) Lakes (acres) Estuary (sq. mi.)	465 2,466 -
Sediment Resuspension (clean)	River (mi) Lakes (acres) Estuary (sq. mi.)	44 0 -

Source of Impairment	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
Sediment Resuspension (contaminated)	River (mi) Lakes (acres) Estuary (sq. mi.)	11 0 -
Silviculture	River (mi) Lakes (acres) Estuary (sq. mi.)	14 0 -
Managed Pasture Grazing	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 -
Drought Related Impacts	River (mi) Lakes (acres) Estuary (sq. mi.)	11 0 -
Erosion from Derelict Land	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 -
Landfills	River (mi) Lakes (acres) Estuary (sq. mi.)	2 0 -
Unspecified Domestic Waste	River (mi) Lakes (acres) Estuary (sq. mi.)	663 2,466 -
Waste from Pets	River (mi) Lakes (acres) Estuary (sq. mi.)	433 157 -
Wildlife other than Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	733 2,466 -

Chowan River-Dismal Swamp Basin

The Chowan River and Dismal Swamp Basin is located in the southeastern portion of Virginia and covers 4,061 square miles or approximately 10 percent of the Commonwealth's total area.

The Basin extends eastward from Charlotte County to the Chesapeake Bay. The Chowan River-Dismal Swamp Basin in Virginia is defined by both hydrologic and political boundaries - the James River Basin and the Small Coastal River Basins to the east, the Roanoke River Basin to the west and the Virginia/North Carolina State line to the south border the basin. The basin is approximately 145 miles in length and varies from 10 to 50 miles in width. The Chowan River-Dismal Swamp Basin flows through the Piedmont and Coastal Plain Physiological Provinces. The Chowan portion flows 130 miles from east to west, crossing both the Piedmont and Coastal Plain, while the Dismal Swamp lies entirely within the Coastal Plain. The Piedmont portion is characterized by rolling hills, steeper slopes and somewhat more pronounced stream valleys. The Coastal Plain, in contrast, is nearly flat with a descending series of terraces.

The Chowan River-Dismal Swamp Basin is mostly rural with approximately 64 percent of its land covered by forest. Cropland and pasture make up another 28 percent, while only about 6 percent is classified as urban.

The 2000 population for the Chowan River-Dismal Swamp Basin was approximately 339,236. All or portions of the following 14 counties and three cities lie within the basin: counties – Greensville, Lunenburg, Southampton, Sussex, Brunswick, Charlotte, Dinwiddie, Isle of Wight, Mecklenburg, Nansemond, Nottoway, Prince Edward, and Surry; Cities – Chesapeake, Franklin, Suffolk, and Virginia Beach.

Major tributaries of the Chowan River are the Meherrin, the Nottoway and the Blackwater. The Nottoway and the Blackwater join at the Virginia/North Carolina state line to form the Chowan River. The Dismal Swamp portion is mostly flat with many swamp and marshland areas.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the Chowan River Basin

The Chowan River-Dismal Swamp Basin has several active citizen and non-agency monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by DEQ for water quality assessment purposes.

The City of Norfolk Lakes and Reservoirs Program monitors two water bodies in the Chowan-Dismal Swamp Basin as part of a routine program to test source water quality for drinking water purposes. Two stations were monitored 33 times. The parameters monitored for were dissolved oxygen, pH, temperature, and salinity. These stations were monitored from February 2003 to November 2004. Upon review of the equipment, calibration logs, and quality assurance project plan, DEQ is accepting data for dissolved oxygen, pH, and temperature for data that proper calibration of the equipment was determined acceptable for assessment purposes.

The United States Geological Survey (USGS) submitted water quality data for 12 sampling stations covering 12 sample events from January 1, 2000 to December 31, 2004. The stations monitored many ambient water quality parameters from dissolved oxygen and pH to dissolved metals. The USGS follows EPA protocols for sampling and analysis of results. USGS monitoring data that have a Virginia Water Quality Standard were used by DEQ to assess water quality at these sample sites

The Virginia Save Our Streams Program of the Virginia Division of the Izaak Walton League of America (VA SOS) coordinates with the J.R. Horsley Soil and Water Conservation District in the Chowan River Basin to monitor benthic macroinvertebrates. Certified VA SOS volunteers monitored 3 stations during 9 sampling events during the 5-year data window for this report. These data were used in this assessment to indicate areas needing potential follow-up monitoring.

The Chowan River-Dismal Swamp Basin is divided into five USGS hydrologic units as follows: HUC 03010204 – Nottoway; HUC 03010202 – Blackwater; HUC 03010203 – Chowan; HUC 03010204 – Meherrin; and HUC 03010205 – Albemarle Sound. The five hydrologic units are further divided into 44 waterbodies or watersheds.

Basin assessment information is presented in Tables 3.2-5-1, 3.2-5-2, 3.2-5-3.

TABLE 3.2-5-1 **CHOWAN-DISMAL SWAMP BASIN INDIVIDUAL USE SUPPORT SUMMARY TABLE**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 5,026 miles
Lakes - 4,347 acres
Estuaries - 81 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	674	856	680	0	3,499	1,530
	Lakes (acres)	0	1,092	326	0	3,254	1,092
	Estuary (sq. mi.)	36	3	0	0	42	39
Fishing	River (mi)	89	115	0	0	4,814	204
	Lakes (acres)	210	3,242	0	0	895	3,452
	Estuary (sq. mi.)	0	0	0	0	81	0
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Swimming	River (mi)	562	663	0	51	3,743	1,225
	Lakes (acres)	718	0	0	374	3,254	718
	Estuary (sq. mi.)	37	0	0	0	44	37
Drinking Water	River (mi)	18	0	0	0	217	18
	Lakes (acres)	887	0	0	0	67	887
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	1,253	42	0	0	3,729	1,253
	Lakes (acres)	942	0	0	0	3404	942
	Estuary (sq. mi.)	39	0	32	0	42	39

TABLE 3.2-5-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN CHOWAN-DISMAL SWAMP BASIN

Pollutant	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	24 0 0
Ammonia	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 0
Benzo(k)fluoranthene	River (mi) Lakes (acres) Estuary (sq. mi.)	27 0 0
Chloride	River (mi) Lakes (acres) Estuary (sq. mi.)	41 0 0
Mercury in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	88 3,242 0
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	254 150 3
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	27 0 0
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	766 1,092 0
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	386 0 0
Escherichia coli Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	428 0 0

TABLE 3.2-5-3 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN CHOWAN-DISMAL SWAMP BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Agriculture	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 0
Animal Feeding Operations	River (mi) Lakes (acres) Estuary (sq. mi.)	21 0 0
Atmospheric Deposition (Toxic)	River (mi) Lakes (acres) Estuary (sq. mi.)	8 0 0
Changes in Ordinary Stratification and Bottom Water Hypoxia/Anoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 360 0
Commercial Districts	River (mi) Lakes (acres) Estuary (sq. mi.)	8 0 0
Crop Land	River (mi) Lakes (acres) Estuary (sq. mi.)	8 0 0
Dam or Impoundment	River (mi) Lakes (acres) Estuary (sq. mi.)	17 0 0
Industrial Point Source Discharge	River (mi) Lakes (acres) Estuary (sq. mi.)	4 0 0
Livestock Grazing	River (mi) Lakes (acres) Estuary (sq. mi.)	53 0 0
Municipal Point source Discharges	River (mi) Lakes (acres) Estuary (sq. mi.)	17 0 0
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	795 326 0
Natural Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	4 0 0
Non Point Source	River (mi) Lakes (acres) Estuary (sq. mi.)	132 0 0
On-site Septic System	River (mi) Lakes (acres) Estuary (sq. mi.)	103 0 0
Residential Districts	River (mi) Lakes (acres) Estuary (sq. mi.)	8 0 0
Sewage Discharge in Unsewered Areas	River (mi) Lakes (acres) Estuary (sq. mi.)	8 0 0
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	640 3793 3

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Unspecified Domestic Waste	River (mi) Lakes (acres) Estuary (sq. mi.)	27 0 0
Unspecified Urban Stormwater	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 0
Wastes from Pets	River (mi) Lakes (acres) Estuary (sq. mi.)	44 0 0
Wildlife other than Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	155 0 0

Tennessee-Big Sandy River Basin

The segment of the Tennessee and Big Sandy River Basin, which lies in Virginia, is made up of the Holston, Clinch-Powell, and Big Sandy River Subbasins. These subbasins are located in the extreme southwest portion of Virginia and cover 4,140 square miles or approximately 10.5 percent of the Commonwealth's total land area.

The Virginia portion of the Tennessee-Big Sandy River Basin is defined by both hydrologic and political boundaries. The West Virginia State line lies to the northeast, Kentucky to the west, and Tennessee to the south. The New River Basin makes up the eastern boundary.

While numerous southwestern Virginia streams feed the Tennessee and Big Sandy Rivers, neither river forms within the Commonwealth itself. The Big Sandy Subbasin contains the Levisa and Tug Forks that flows northward into Kentucky forming the Big Sandy River. The southwestward flowing Holston, Clinch, and Powell tributaries form the Tennessee River in Tennessee. Both of the major river subbasins eventually empty into the Gulf of Mexico via the Ohio and Mississippi Rivers.

The Tennessee-Big Sandy River Basin spans three physiographic provinces: Cumberland Plateau, Valley and Ridge, and the Blue Ridge. The Big Sandy portion of the basin lies within the Cumberland Plateau. This province is characterized as rugged, with mountainous terrain and steep valleys. Parallel valleys and ridges running in a northeast to southwest direction characterize the Tennessee portion, lying in the Valley and Ridge Province. A small portion, located in the Blue Ridge Province, is more plateau-like, with no single, prominent ridge that characterizes the Ridge and Valley province to the north.

Within Virginia, approximately 48 percent of the Tennessee River Basin is forested, while cropland and pasture make up another 39.7 percent. The Big Sandy portion of the basin is approximately 86 percent forest, with only about 5 percent in cropland and pasture. Urban areas make up only a small percentage of the total land area.

The 2000 population for the Tennessee-Big Sandy River Basin was approximately 298,281. All or parts of the following jurisdictions lie within the basin: counties – Lee, Scott, Russell, Washington, Smyth, Tazewell, Buchanan, Dickinson, Bland, Wythe, Grayson, and Wise; Cities – Norton and Bristol.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the Tennessee-Big Sandy River Basin

The Tennessee and Big Sandy River Basins have several active citizen and non-agency monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by DEQ for water quality assessment purposes.

The Tennessee Valley Authority has conducted reservoir monitoring along the South Fork of the Holston River. The monitoring consisted of fecal coliform and E. coli bacteria monitoring. This monitoring occurred at 5 stations for 70 sample events from May 2002 to June 2004. Monitoring occurred during the months of May and June during each sample year. Sampling and analysis followed standard methods therefore, DEQ is accepting this data for assessment use.

The United States Forest Service conducts an intensive ambient and benthic macroinvertebrate study in and around the many national forests in Virginia. The USFS has monitored at 56 stations covering 143 sample events from January 2000 to December 2004. Upon review of sampling protocols, DEQ will use the benthic macroinvertebrate data in assessing water quality.

The Virginia Save Our Streams Program of the Virginia Division of the Izaak Walton League of America (VA SOS) coordinates with several affiliate organizations in the Tennessee-Big Sandy River Basin to monitor benthic macroinvertebrates. Affiliate organizations in this basin include the Emory and Henry College, Grundy High School Earth Science Class, Headwaters Association, Holston River Water Quality Monitors, Hungry Mother State Park, and the Kittrell Stream Team. Certified VA SOS volunteers

conducted 34 sampling events at 16 stations in this river basin during the data window for this report. These data were used in this assessment to indicate areas needing potential follow-up monitoring.

The Tennessee-Big Sandy River Basin is divided into six USGS hydrologic units as follows: HUC 05070201 – Tug Fork; HUC 05070202 – Upper Levisa; HUC 06010101 – North Fork Holston; HUC 06010102 - South and Middle Fork Holston; HUC 06010205 – Upper Clinch; and HUC 01010206 – Powell River. The six hydrologic units are further divided into 48 waterbodies or watersheds.

Basin assessment information is presented in Tables 3.2-6-2, 3.2-6-2, 3.2-6-3.

TABLE 3.2-6-1 **TENNESSEE – BIG SANDY RIVER BASIN INDIVIDUAL USE SUPPORT SUMMARY**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 5,848 miles
Lakes - 3,708 acres
Estuaries - 0 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	713	374	0	359	4,400	1,087
	Lakes (acres)	0	3,708	734	0	0	3,708
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Fishing	River (mi)	121	274	0	0	5,453	395
	Lakes (acres)	1,490	0	0	0	2,218	1,490
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Swimming	River (mi)	167	669	0	242	4,770	836
	Lakes (acres)	3,565	0	0	0	144	3,565
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Public Water Supply	River (mi)	0	0	0	0	265	0
	Lakes (acres)	0	0	0	0	3,239	0
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	993	6	0	3	4,845	999
	Lakes (acres)	3,565	0	0	0	144	3,565
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA

TABLE 3.2-6-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN TENNESSE-BIG SANDY BASIN

Pollutant	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	369 0 -
Chloride	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 -
Mercury in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	82 0 -
Lead	River (mi) Lakes (acres) Estuary (sq. mi.)	7 0 -
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	274 0 -
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	5 1,847 -
Temperature	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 -
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	0 2,009 -
Dissolved Oxygen Saturation	River (mi) Lakes (acres) Estuary (sq. mi.)	0 1,699 -
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	329 0 -
Escherichia coli Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	396 0 -

TABLE 3.2-6-3 WATERS NOT MEETING DESIGNATED USE BY VAROUS SOURCE CATEGORIES IN TENNESSE-BIG SANDY BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Acid Mine Drainage	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 -
Animal Feeding Operations	River (mi) Lakes (acres) Estuary (sq. mi.)	172 0 -
Agriculture	River (mi) Lakes (acres) Estuary (sq. mi.)	56 0 -
Atmospheric Deposition – Acidity	River (mi) Lakes (acres) Estuary (sq. mi.)	9 0 -
Changes in Ordinary Stratification and Bottom Water Hypoxia/Anoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 1,275 -
Coal Mining (Surface & Subsurface)	River (mi) Lakes (acres) Estuary (sq. mi.)	28 0 -
Drought Related Impacts	River (mi) Lakes (acres) Estuary (sq. mi.)	3 0 -
Grazing in Riparian or Shoreline Zones	River (mi) Lakes (acres) Estuary (sq. mi.)	78 0 -
Illegal dumps or other Inappropriate Waste Disposal	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 -
Impacts from Abandoned Mine Lands	River (mi) Lakes (acres) Estuary (sq. mi.)	3 0 -
Industrial Point Source Discharge	River (mi) Lakes (acres) Estuary (sq. mi.)	82 0 -
Livestock Grazing or Feeding Operations	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 -
Loss of Riparian Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	35 0 -
Rural (Residential Areas)	River (mi) Lakes (acres) Estuary (sq. mi.)	261 0 -
Septage Disposal	River (mi) Lakes (acres) Estuary (sq. mi.)	47 0 -
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	523 0 -
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	0 3,708 -

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Streambank Modification	River (mi) Lakes (acres) Estuary (sq. mi.)	36 0 -
Surface Mining	River (mi) Lakes (acres) Estuary (sq. mi.)	60 0 -
Unpermitted Discharge	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 -
Wastes from Pets	River (mi) Lakes (acres) Estuary (sq. mi.)	2 0 -

Chesapeake Bay and Small Coastal Basins

The Chesapeake Bay/Small Coastal Basin is located in the eastern part of Virginia and covers 1,588 square miles or approximately 4 percent of the Commonwealth's total land area. The basin encompasses the small bays, river inlets, islands and shoreline immediately surrounding the Chesapeake Bay and the southern tip of the Delmarva Peninsula. This basin also includes the Chesapeake Bay itself.

The Chesapeake Bay/Coastal Basin is defined by both hydrologic and political boundaries. The Potomac River Basin, the Rappahannock River Basin, the York River Basin, the James River Basin and the Chowan River-Dismal Swamp Basin border the basin to its west. The Eastern Shore portion is bordered on the west by the Chesapeake Bay, on the north by Maryland, and on the east by the Atlantic Ocean.

The topography of the Chesapeake Bay/Coastal Basin varies little. The entire basin lies within the Coastal Plain Physiographic Province where elevations average no more than a few feet above sea level. More significant elevation occurs along the central spine of the Eastern Shore portion, which forms a plateau about 45 feet above sea level. Much of the Chesapeake Bay/Coastal Basin is marshland. About 30 percent of the Chesapeake Bay/Coastal Basin is forested, while nearly 21.6 percent is in cropland and pasture. Approximately 24 percent is considered urban.

The 2000 population for the Chesapeake Bay/Coastal Basin was approximately 551,210. All or portions of the following jurisdictions lie within the basin: counties – Accomack, Northampton, Matthews, Northumberland, Lancaster, Middlesex, Gloucester, York, and Nansemond; cities – Portsmouth, Norfolk, Chesapeake, Virginia Beach, Hampton, and Newport News. Tributaries in the Chesapeake Bay/Coastal Basin drain into the Chesapeake Bay or the Atlantic Ocean. Major tributaries flowing into the Chesapeake Bay from the western shore are the Great Wicomico, Piankatank, Fleets Bay, Mobjack Bay including the East, North, Ware, and Severn Rivers, Poquoson, Back River and Lynnhaven. Tributaries in the Eastern Shore portion that drain into the Bay are Pocomoke, Onancock, Pungoteague, Occohannock, and Nassawadox Creeks. Machipongo River, Cat Point Creek, Assawoman Creek, Parker Creek, Folly Creek, and Finney Creek drain east directly into the Atlantic Ocean.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the Chesapeake Bay and Small Coastal River Basins

The Chesapeake Bay and Small Coastal River Basins have several active citizen and non-agency monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by DEQ for water quality assessment purposes.

The Alliance for the Chesapeake Bay (ACB) coordinates with several affiliate organizations in the Chesapeake Bay and Small Coastal River Basins to monitor a conventional suite of ambient chemical parameters including dissolved oxygen, temperature, pH, salinity and water clarity. ACB also coordinates monitoring at selected sites for a suite of parameters (including nutrients, water clarity, total suspended solids and chlorophyll *a*) related to submerged aquatic vegetation (SAV). Affiliate organizations within this basin include the Chesapeake Bay Foundation - York Chapter and the Eastern Shore Soil and Water Conservation District. Trained volunteers monitored 32 stations and conducted 1,359 sampling events in these basins during the five-year data window for this report. Some of this data met DEQ criteria for use directly for assessing water quality for dissolved oxygen and temperature. Other data not meeting the criteria were used in this assessment to indicate areas needing potential follow-up monitoring.

The United States Geological Survey (USGS) submitted water quality data for 4 sampling stations covering 153 sample events from January 1, 2000 to December 31, 2004. The stations monitored many ambient water quality parameters from dissolved oxygen and pH to dissolved metals. The USGS follows EPA protocols for sampling and analysis of results. USGS monitoring data that have a Virginia Water Quality Standard were used by DEQ to assess water quality at these sample sites.

The Chesapeake Bay/Coastal Basin is divided into seven USGS hydrologic units as follows: HUC 02060009 – Pocomoke River; HUC 02060010 – Chincoteague Bay; HUC 02080101 – Mainstem open bay; HUC 02080102 – Upper Western Shore Tributaries; HUC 02080108 – Lower Western Shore Tributaries; HUC 02080109 – Tributaries on the Eastern Shore which drain to the Chesapeake Bay; and HUC 2080110 – Tributaries on the Eastern Shore which drain to the Atlantic Ocean. The seven hydrologic units are further divided into 31 waterbodies or watersheds.

Basin assessment information is presented in Table 3.2-7-1, 3.2-7-2, 3.2-7-3.

TABLE 3.2-7-1 CHESAPEAKE BAY-SMALL COASTAL BASIN INDIVIDUAL USE SUPPORT SUMMARY TABLE

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 976 miles
Lakes - 1,775 acres
Estuaries - 1,774 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	26	94	31	21	834	120
	Lakes (acres)	1,346	347	0	54	28	1,693
	Estuary (sq. mi.)	9	1,639	0	23	73	1,648
Fishing	River (mi)	7	31	0	0	937	38
	Lakes (acres)	1,016	534	0	28	197	1,550
	Estuary (sq. mi.)	2	1,638	0	0	106	1,640
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	1,703	36	0	0	0	1,739
Swimming	River (mi)	65	48	0	0	862	112
	Lakes (acres)	553	0	0	0	1.222	553
	Estuary (sq. mi.)	65	14	0	5	1,661	79
Public Water Supply	River (mi)	0	0	0	0	14	0
	Lakes (acres)	0	0	0	0	1,775	0
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	107	4	0	1	863	111
	Lakes (acres)	295	258	0	0	1,222	553
	Estuary (sq. mi.)	91	0	0	23	1,630	91

Chesapeake Bay Designated Uses

Open Water Aquatic Life Use	Estuary (sq. mi.)	1	1,183	0	455	0	1,184
Deep Water Aquatic Life Use	Estuary (sq. mi.)	0	409	0	0	0	409
Deep Channel Aquatic Life Use	Estuary (sq. mi.)	0	0	0	0	138	0
Submerged Vegetation	Estuary (sq. mi.)	47	43	0	0	0	90
Migratory Spawning	Estuary (sq. mi.)	0	0	0	0	7	0

TABLE 3.2-7-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN CHESAPEAKE BAY – SMALL COASTAL BASIN

Pollutant	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Aquatic Plants (Macrophytes)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 90
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	18 0 282
Chloride	River (mi) Lakes (acres) Estuary (sq. mi.)	3 0 0
Copper	River (mi) Lakes (acres) Estuary (sq. mi.)	1 258 0
Mercury	River (mi) Lakes (acres) Estuary (sq. mi.)	0 28 0
Mercury in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	31 77 3
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	53 33 0
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	0 534 1,638
PCB's	River (mi) Lakes (acres) Estuary (sq. mi.)	0 28 0
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	63 347 1,411
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	36 0 36
Escherichia coli Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	17 0 0
Enterococcus Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	12 0 0

TABLE 3.2-7-3 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN CHESAPEAKE BAY – SMALL COASTAL BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Agriculture	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1,638
Atmospheric Deposition – Nitrogen	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1,638
Changes in Ordinary Stratification and Bottom Water Hypoxia/Anoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 17
Clean Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1,635
Discharge from Municipal Separate Storm Sewer Systems	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 8
Industrial Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 1,638
Internal Nutrient Cycling	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 1,638
Leaking Underground Storage Tanks	River (mi) Lakes (acres) Estuary (sq. mi.)	2 0 0
Loss of Riparian Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1,638
Urbanized High Density Area	River (mi) Lakes (acres) Estuary (sq. mi.)	7 258 2
Municipal Point Source Discharges	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1,638
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	31 0 1
Natural Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 7
Non-Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 8
On-site treatment Systems	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 7
Sediment Resuspension (Clean)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 90
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	109 886 1,640

Source of Impairment	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
Sources Outside State Jurisdiction or Borders	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1,638
Wet Weather Discharge (Non Point Source)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 101
Wet Weather Discharge (Point Source)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 1,638

York River Basin

The York River Basin lies in the central and eastern section of Virginia and covers 2,662 square miles or 7 percent of the Commonwealth's total area. It is defined by hydrologic boundaries. The basin is bound by the Rappahannock River Basin to the north and east and the James River Basin to the south and west.

The headwaters of the York River begin in Orange County and flow in a southeasterly direction for approximately 220 miles to its mouth at the Chesapeake Bay. The basin's width varies from five miles at the mouth to 40 miles at its headwaters.

The basin is comprised of the York River and its two major tributaries, the Pamunkey and the Mattaponi Rivers. The York River itself is only about 30 miles in length. The Pamunkey River's major tributaries are the North and South Anna Rivers and Little River, while the major Mattaponi tributaries are the Matta, the Po and Ni Rivers.

Lying in the Piedmont and Coastal Plain physiographic provinces, the basin's topography is characterized by slightly rolling hills at the headwaters or extreme western portion, to gently sloping hills and flat farmland near its mouth. Tributaries in the central Piedmont exhibit moderate and near constant profiles. Their flat slope largely characterizes streams in the Coastal Plain. Approximately 65 percent of the land area is forest. Farmland and pasture account for approximately 20 percent of the land area. Approximately 10 percent of the river basin land area is urban.

The 2000 population for the York River Basin was approximately 203,159. The majority of the population is rural, evenly distributed throughout the basin. No major cities lie within the basin.
All or portions of the following twelve counties lie within the basin: Caroline, Goochland, Hanover, Louisa, Orange, Spotsylvania, Gloucester, James City, King and Queen, King William, New Kent and York.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the York River Basin

The York River Basin has a number of active citizen and non-agency monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by DEQ for water quality assessment purposes.

The Alliance for the Chesapeake Bay (ACB) coordinates with several affiliate organizations in the York River Basin to monitor a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, salinity and water clarity. ACB also coordinates monitoring at selected sites for a suite of parameters (including nutrients, water clarity, total suspended solids and chlorophyll *a*) related to submerged aquatic vegetation (SAV). Affiliate organizations in this basin include the York Chapter of the Chesapeake Bay Foundation, Mattaponi Indian Reservation, and York River State Park. Trained volunteers monitored 15 stations and conducted 781 sampling events in the York River Basin during the five-year data window for this report. Some of this data met DEQ criteria for use directly for assessing water quality for dissolved oxygen, and temperature. Other data not meeting the criteria were used in this assessment to indicate areas needing potential follow-up monitoring.

The Historic Green Springs, Inc. conducted monitoring in the York River Basin for temperature, pH, nutrients, and total suspended solids. Trained volunteers monitored 5 stations and conducted 22 sampling events in this basin during the data window for this assessment. The data for these sites were used in this assessment to indicate areas needing potential follow-up monitoring.

The Lake Anna Civic Association conducted monitoring on Lake Anna and its tributaries for a conventional suite of ambient parameters including dissolved oxygen, temperature, pH, fecal coliform bacteria, total phosphorus and water clarity. Trained volunteers monitored 28 stations and conducted 283 sampling events in this basin during the data window for this report. Data collected for dissolved oxygen, pH, temperature, total phosphorous, fecal coliform, and E. coli will be used directly by DEQ for assessment purposes.

The United States Geological Survey (USGS) submitted water quality data for 14 sampling stations covering 175 sample events from January 1, 2000 to December 31, 2004. The stations monitored many ambient water quality parameters from dissolved oxygen and pH to dissolved metals. The USGS follows EPA protocols for sampling and analysis of results. USGS monitoring data that have a Virginia Water Quality Standard were used by DEQ to assess water quality at these sample sites.

The York River Basin is divided into three USGS hydrologic units as follows: HUC 02080102 – York River Subbasin, HUC 02080105 – Mattaponi River Subbasin; HUC 02080106 and Pamunkey River Subbasin. The three hydrologic units are further divided into 23 waterbodies or watersheds.

Basin assessment information is presented in Tables 3.2-8-1, 3.2-8-2, 3.2-8-3.

TABLE 3.2-8-1 **YORK RIVER BASIN INDIVIDUAL USE SUPPORT SUMMARY TABLE**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 3,325 miles
Lakes - 11,565 acres
Estuaries - 84 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	378	240	201	0	2,678	618
	Lakes (acres)	10,520	315	0	0	730	140,835
	Estuary (sq. mi.)	0	84	0	0	0	84
Fishing	River (mi)	153	30	0	0	3,143	183
	Lakes (acres)	1,059	9,667	0	0	839	10,726
	Estuary (sq. mi.)	13	62	0	0	9	75
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	49	12	0	0	0	61
Swimming	River (mi)	259	212	0	44	2,811	471
	Lakes (acres)	9,900	0	0	0	1,665	9,900
	Estuary (sq. mi.)	63	13	0	1	7	76
Public Water Supply	River (mi)	7	0	0	0	250	7
	Lakes (acres)	0	0	0	0	1,047	0
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	487	0	0	22	2,816	487
	Lakes (acres)	9,849	0	0	0	1,716	9,849
	Estuary (sq. mi.)	26	8	8	0	49	34

Chesapeake Bay Designated Uses

Open Water Aquatic Life Use	Estuary (sq. mi.)	0	84	0	0	0	84
Deep Water Aquatic Life Use	Estuary (sq. mi.)	0	11	0	0	0	11
Deep Channel Aquatic Life Use	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Submerged Vegetation	Estuary (sq. mi.)	2	3	0	0	0	5
Migratory Spawning	Estuary (sq. mi.)	0	0	0	0	32	0

TABLE 3.2-8-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN YORK BASIN

Pollutant	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
Aquatic Plants (Macrophytes)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 3
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	8 0 63
Benzo(k)fluoranthene	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 0
Chloride	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 8
Enterococcus Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 13
E. coli Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	141 0 0
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	17 9,585 58
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	183 0 3
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	56 315 84
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	112 0 12
Mercury in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	17 82 5

TABLE 3.2-8-3 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN YORK BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Agriculture	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 84
Atmospheric Deposition (Nitrogen)	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 0
Atmospheric Deposition (Toxics)	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 0
Changes in Stratification and Bottom Water Hypoxia	River (mi) Lakes (acres) Estuary (sq. mi.)	0 315 0
Clean Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 64
Contaminated Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 5
Impacts from Abandoned Mine Lands	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 0
Impacts from Land Application of Wastes	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 0
Livestock Grazing	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 0
Industrial Point Source Discharge	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 84
Internal Nutrient Recycling	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 84
Loss of Riparian Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 84
Municipal Point Source Discharges	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 84
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	204 0 11
Runoff from Grassland/Forests	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 0
Sediment Resuspension (Clean)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 3
Non Point Sources	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 11

Source of Impairment	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
Sewage Discharge in Unsewered Areas	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 0
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	201 9,982 73
Sources Outside of State Jurisdiction	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 84
Wastes from Pets	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 0
Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 0
Wet Weather Discharges (Non Point Sources)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 6
Wet Weather Discharges (Point Sources)	River (mi) Lakes (acres) Estuary (sq. mi.)	0 0 84
Wildlife Other Than Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	33 0 0

New River Basin

The New River Basin is located in southwest Virginia and covers 3,070 square miles or approximately 8 percent of the Commonwealth's total land area. The New River flows from its headwaters in Watauga County, North Carolina in a northeasterly direction to Radford, Virginia, and then in a northwesterly direction to Glen Lyn, where it exits into West Virginia. There it flows to the confluence of the Gauley River forming the Kanawha River, a tributary to the Ohio River.

The New River Basin in Virginia is defined by both hydrologic and political boundaries. It is bordered by the James River Basin and Roanoke River Basin to the east, and the Big Sandy River Basin and Tennessee River Basin to the west. The southern boundary of the Virginia portion is the North Carolina State line and its northwest boundary is the West Virginia State line.

The New River Basin runs 115 miles in length from Blowing Rock, North Carolina to Bluestone Dam near Hinton, West Virginia with a maximum basin width of 70 miles near Rural Retreat, Virginia. The Virginia portion of the New River Basin is 87 miles in length.

The topography of the New River Basin is generally rugged, the upper reaches of it tributaries being extremely steep. High mountains, narrow valleys and steep ravines characterize the basin. There are ten tributaries in the Upper New River Basin each having more than 100 square miles in drainage area and many others with forty or more square miles.

The New River Basin is the least densely populated of the Commonwealth's major river basins. The higher elevations of the basin have steep slopes and are thickly forested, while the mount bases are mostly used for agriculture. Approximately 59 percent of its land is forested. Cropland and pasture make up another 35 percent, with approximately 3 percent considered urban.

The 2000 population for the New River Basin was approximately 240,564. All or portions of the following 11 counties lie within the basin: Grayson, Carroll, Smyth, Wythe, Pulaski, Floyd, Montgomery, Tazewell, Bland Giles, and Craig and the cities of Galax and Radford.

Citizen-Generated and Non-Agency Water Quality Monitoring Data in the New River Basin

The New River Basin has a number of active citizen and non-agency monitoring organizations collecting and analyzing both ambient and benthic macroinvertebrate data. The organizations described in this section submitted data where one or more parameters were collected using documented protocols, standard operating procedures, and quality assurance/quality control procedures approved by DEQ for water quality assessment purposes.

The United States Forest Service conducts an intensive ambient and benthic macroinvertebrate study in and around the many national forests in Virginia. The USFS has monitored at 37 stations covering 108 sample events from January 2000 to December 2004. Upon review of sampling protocols, DEQ will use the benthic macroinvertebrate in assessing water quality.

The Virginia Save Our Streams Program of the Virginia Division of the Izaak Walton League of America (VA SOS) coordinates with a number of affiliate organizations in the New River Basin to monitor benthic macroinvertebrates. Affiliate organizations in this basin include Bluestone Watershed Committee, Elliott Creek Watershed Protection Council, Radford University Green Team, Virginia Museum of Natural History at Virginia Tech, Virginia Tech Student Chapter of the American Water Resources Association, and the Walker Creek Watershed Group. Certified VA SOS volunteers sampled 24 stations during 51 sampling events for benthic macroinvertebrates. These data were used in this assessment to indicate areas needing potential follow-up monitoring.

The New River Basin is divided into two USGS hydrologic units as follows: HUC 05050001 – Upper New; and HUC 05050002 – Middle New. The two hydrologic units are further divided into 35 waterbodies or watersheds.

Basin assessment information is presented in Tables 3.2-9-1, 3.2-9-2, 3.2-9-3.

TABLE 3.2-9-1 **NEW RIVER BASIN INDIVIDUAL USE SUPPORT SUMMARY TABLE**

Basin Size: ***All Sizes Rounded to Nearest Whole Number***
Rivers - 4,105 miles
Lakes - 4,943 acres
Estuaries - 0 sq. miles

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Total Assessed
Aquatic Life	River (mi)	793	99	11	107	3,106	892
	Lakes (acres)	359	4,548	2,745	0	36	4,907
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Fishing	River (mi)	135	135	0	0	3,836	270
	Lakes (acres)	0	4,287	0	0	656	4,287
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Shellfishing	River (mi)	NA	NA	NA	NA	NA	NA
	Lakes (acres)	NA	NA	NA	NA	NA	NA
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Swimming	River (mi)	137	598	0	35	3,335	735
	Lakes (acres)	4,471	376	0	0	96	4,847
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Public Water Supply	River (mi)	26	0	0	0	317	26
	Lakes (acres)	1,999	0	0	0	36	1,999
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA
Wildlife	River (mi)	812	0	0	0	3,294	812
	Lakes (acres)	4,847	0	0	0	96	4,847
	Estuary (sq. mi.)	NA	NA	NA	NA	NA	NA

TABLE 3.2-9-2 WATERS NOT MEETING DESIGNATED USE BY VARIOUS CAUSE CATEGORIES IN NEW BASIN

Pollutant	*Type*	**Total Impaired** ***(Rounded to Nearest Whole Number)***
General Standards (Benthics)	River (mi) Lakes (acres) Estuary (sq. mi.)	80 0 -
Chlordane	River (mi) Lakes (acres) Estuary (sq. mi.)	1 0 -
Copper	River (mi) Lakes (acres) Estuary (sq. mi.)	4 0 -
DDE	River (mi) Lakes (acres) Estuary (sq. mi.)	10 0 -
DDT	River (mi) Lakes (acres) Estuary (sq. mi.)	10 0 -
Mercury in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	27 0 -
pH	River (mi) Lakes (acres) Estuary (sq. mi.)	0 1,889 -
Heptachlor Epoxide	River (mi) Lakes (acres) Estuary (sq. mi.)	10 0 -
Zinc	River (mi) Lakes (acres) Estuary (sq. mi.)	4 0 -
PCB's	River (mi) Lakes (acres) Estuary (sq. mi.)	3 0 -
PCB in Fish Tissue	River (mi) Lakes (acres) Estuary (sq. mi.)	105 4,287 -
Dissolved Oxygen	River (mi) Lakes (acres) Estuary (sq. mi.)	5 4,287 -
Temperature	River (mi) Lakes (acres) Estuary (sq. mi.)	28 0 -
Fecal Coliform Pathogen Indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	351 298 -
Escherichia coli Pathogen indicators	River (mi) Lakes (acres) Estuary (sq. mi.)	381 376 -

TABLE 3.2-9-3 WATERS NOT MEETING DESIGNATED USE BY VARIOUS SOURCE CATEGORIES IN NEW BASIN

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Channelization	River (mi) Lakes (acres) Estuary (sq. mi.)	16 0 -
Animal Feeding Operations	River (mi) Lakes (acres) Estuary (sq. mi.)	53 0 -
Discharge from Municipal Separate Storm Sewer Systems	River (mi) Lakes (acres) Estuary (sq. mi.)	19 0 -
Contaminated Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 -
Impacts from Abandoned Mine lands	River (mi) Lakes (acres) Estuary (sq. mi.)	9 0 -
Livestock Grazing or Feeding Operations	River (mi) Lakes (acres) Estuary (sq. mi.)	467 78 -
Loss of Riparian Habitat	River (mi) Lakes (acres) Estuary (sq. mi.)	28 0 -
Urbanized High Density Area	River (mi) Lakes (acres) Estuary (sq. mi.)	63 78 -
Industrial Point Source Stormwater Discharges	River (mi) Lakes (acres) Estuary (sq. mi.)	4 0 -
Natural Conditions – Water Quality Use Attainability	River (mi) Lakes (acres) Estuary (sq. mi.)	0 4,548 -
Erosion and Sedimentation	River (mi) Lakes (acres) Estuary (sq. mi.)	12 0 -
On-site Treatment Systems	River (mi) Lakes (acres) Estuary (sq. mi.)	272 0 -
Rural (Residential Areas)	River (mi) Lakes (acres) Estuary (sq. mi.)	25 0 -
Sanitary Sewer Overflows	River (mi) Lakes (acres) Estuary (sq. mi.)	7 78 -
Septage Disposal	River (mi) Lakes (acres) Estuary (sq. mi.)	5 0 -
Source Unknown	River (mi) Lakes (acres) Estuary (sq. mi.)	223 4,585 -
Sediment Resuspension (Clean)	River (mi) Lakes (acres) Estuary (sq. mi.)	32 0 -

Source of Impairment	*Type*	**Total Impaired** *(Rounded to Nearest Whole Number)*
Streambank Modification and Destabilization	River (mi) Lakes (acres) Estuary (sq. mi.)	12 0 -
Contaminated Sediments	River (mi) Lakes (acres) Estuary (sq. mi.)	6 0 -
Unspecified Domestic Waste	River (mi) Lakes (acres) Estuary (sq. mi.)	301 78 -
Pet Waste	River (mi) Lakes (acres) Estuary (sq. mi.)	112 78 -
Wildlife other than Waterfowl	River (mi) Lakes (acres) Estuary (sq. mi.)	301 78 -